(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 055 431 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.11.2000 Bulletin 2000/48

(51) Int. Cl.[7]: **A61M 16/16**, A61M 16/00

(21) Application number: **00109815.1**

(22) Date of filing: **09.05.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **10.05.1999 NZ 33569499**

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(54) A water chamber

(57) A water chamber (1) has a horizontally orientated gas inlet (2) with an elongate flow tube (7) extending into the water chamber (1) from the inner periphery of the gases inlet (2). An inlet end of the elongate flow tube (7) covers the inlet (2) and an outlet end of the flow tube (7) is spaced from the wall of the chamber (1). In use the flow tube (7) receives gases supplied to the gases inlet (2), the gases pass through the flow tube (7) and exit the flow tube at the outlet end distant from the wall.

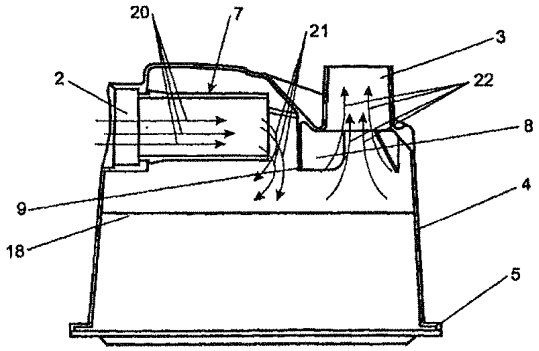

FIGURE 2

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Description

BACKGROUND TO THE INVENTION

i) Field of the Invention

[0001] The present invention relates to water chambers for gases humidification and in particular to water chambers for "slide-on" humidifiers and CPAP machines.

ii) Summary of the Prior Art

[0002] In the prior art humidification systems are well known which include a heater base and a disposable humidifier chamber which is fitted onto the heater base and within which a supply of water can be heated by the heater base. Air passing through the chamber from an inlet to an outlet is humidified by the evaporation of water from the water supply.

[0003] Humidifier chambers of this type are also now used in compact and portable ventilation machines, for example machines intended for the home treatment of obstructive sleep apnoea (CPAP machines). These machines pose a particular difficulty as the air flow is delivered directly to the humidifier chamber from the air blower of the CPAP machine and this can generate an annoying noise level within the humidifier chamber. Furthermore where the CPAP machine is adapted for use with slide-on humidifier chambers, and the connection of the chamber to the machine is accomplished within the single sliding movement, the inlet air port is consequently provided horizontally through a side of the chamber. Locating the inlet port in the side of the chamber significantly increases the likelihood of water spillage from the chamber if the chamber is tilted with water therein. This can be of particular disadvantage where the water may flow out through the inlet port and into the air blower of the CPAP machine.

SUMMARY OF THE INVENTION

[0004] It is therefore an object of the present invention to provide a water chamber which at least goes some way towards overcoming the above disadvantages or which will at least provide the public with a useful choice.

[0005] In a first aspect the invention consists in a water chamber adapted for use in conjunction with a heater base and having a horizontally oriented gases inlet in a wall thereof characterised by an elongate flow cube extending into said water chamber from the inner periphery of said gases inlet, an inlet end of said elongate flow tube covering said inlet and an outlet end of said flow tube being spaced from the wall of said chamber, said flow tube in use receiving, at said inlet end, gases supplied to said gases inlet, said gases passing through said flow tube and exiting said flow tube at said outlet end distant from said wall.

[0006] To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Figure 1 is a perspective view of a water chamber according to the preferred embodiment of the present invention,

Figure 2 is a cross sectional side elevation of the chamber of Figure 1,

Figure 3 is a front elevation of the chamber of Figure 2 before insertion of the inlet extension tube,

Figure 4 is a perspective view of an extension tube according to the preferred embodiment of the present invention,

Figure 5 is a cross sectional side elevation detail of engagement of the extension tube of Figure 4 with the sealing flange of the chamber inlet, and

Figure 6 is a cross sectional side elevation of the chamber of Figure 1 in use with water therein and in a tilted condition demonstrating the operation of the inlet extension tube 7 in reducing the capacity for leakage trough the gases inlet 2.

DETAILED DESCRIPTION

[0008] Referring to Figures 1 and 2 a water chamber is illustrated particularly for use in a portable CPAP machine adapted to receive slide-on chambers and which makes the gases inlet connection to the chamber in the same slide-on motion. The chamber 1 has a transparent plastic shell 4 and a heat conductive base 6. The shell 1 and heat conductive base 6 are connected at a peripheral flange 5 which also serves as a securing flange in the slide-on connection with the CPAP machine. The chamber includes a horizontally aligned gases inlet 2 which in use fits over a blower nozzle of the CPAP machine. A gases outlet 3 is provided in the roof of the chamber 1. The gases outlet 3 may be adapted to take standard breathing circuit fittings.

[0009] Referring to Figure 2 the water chamber 1 is shown in cross section. In the present invention the water chamber 1 includes an inlet extension tube 7 extending inwardly into the chamber interior from the periphery of the gases inlet 2. In the most preferred embodiment the chamber further includes a curved downwardly extending baffle 8 located between the gases outlet 3 and the termination of the inlet extension

tube 7 to ensure against gases short circuiting the chamber by flowing directly from the extension 7 to the outlet 3. With the baffle 8 in place the gases are forced to follow a more tortuous path ensuring adequate humidification during their journey through the chamber 1.

[0010] The lower edge 9 of the baffle 8 preferably extends lower than the lower edge of the inlet extension tube 7.

[0011] A narrow rib 18 may be provided on the inside wall of the clear plastic shell 4 which will show visually from the outside of the shell to act as an optimum water level "fill" marker.

[0012] In use air is received from the blower of the CPAP machine, or if the chamber is used in a standard humidification circuit, then from the ventilator, through inlet 2. Travelling through the inlet extension tube 7 the air is imparted with a more controlled laminar flow than is generally provided by the blower, as indicated by arrows 20. On exiting the inlet extension tube 7 the air is deflected by the baffle 8 to the various environs of the water chamber as indicated by arrows 21. Air eventually leaves the chamber through outlet 3 as indicated by arrows 22.

[0013] By providing the inlet extension tube 7 and therefore imparting an improved flow pattern to the inlet flow, it has been found that the noise level of the humidifier chamber has been significantly reduced, and, in conjunction with the curved baffle 8, effective operation of the water chamber 1 has been maintained. Additionally, with reference to Figure 6, the inlet extension tube 7 acts as a weir against water flow back through gases inlet 2 upon tilting of the chamber 1.

[0014] These benefits have been achieved while maintaining, in the design shown, equivalent external appearance and size, and the same ease of use and simplicity to the user, as earlier chambers.

[0015] Referring now to Figures 3-5, these depict the preferred embodiment of the present invention, and in particular the detail of the connection between the inlet extension tube 7 and the plastic shell 1. Note that the inlet extension tube 7 is preferably moulded from the same clear thermoplastic material as the chamber shell 4.

[0016] For ease of assembly the extension tube 7 is preferably provided as a snap fit to the inlet 2, so that it can be pushed into the chamber through the inlet 2 and, upon application of sufficient force, snap into a substantially watertight and secure condition.

[0017] To these ends the inlet 2 is provided with an inwardly perpendicularly extending annular flange 10 at the inner end thereof. The inlet extension tube 7 includes a similar perpendicularly outwardly extending flange 12 from one end of the generally tapering tubular body 16. The flanges 10 and 12 act together as sealing flanges in the fitted and assembled condition as shown in Figures 2 and 5.

[0018] To retain the extension tube 7 in the assembled condition, against both translational and rotational movement several securing mechanisms are provided. In each case the securing mechanisms may be provided on either of the inlet 2 or the inlet extension tube 7, however it is preferred that they be on the inlet extension tube 7, as both components are intended for injection moulding and injection moulding of certain protrusions on the inner surface of the inlet 2 would be considerably more difficult than on the outer surface of the tube 7.

[0019] To secure the tube 7 against translational movement, and in a sealing condition between the sealing flanges 10, 12 a plurality (preferably two) of retaining clip protrusions 13 are provided spaced around the circumference of the tubular body 16 of the extension tube 7 adjacent but spaced from the flange 12. The protrusions 13 are preferably spaced from the flange 12 at a distance correlating to the thickness of flange 10. In use, as depicted in the detail Figure 5 the flange 10 is secured between an upstanding edge of the protrusion 13 and the leading face of the flange 12.

[0020] Particularly for ease of manufacture, and ensuring a simple two part injection mould, a notch 14 is allowed in the flange 12 of the tubular extension 7 adjacent the protrusion 13.

[0021] To retain the tubular extension 7 against rotational movement when snap fitted into location one or more, preferably 2, locating protrusions 15 are provided circumferentially distributed on the outer surface of the tubular body 16 of the inlet extension tube 7, adjacent and contiguous with the outwardly and perpendicularly extending flange 12. The locating protrusions 15 are preferably generally tapered in both the circumferential and axial direction. Complementary notches 11 are provided in the inwardly extending flange 10 of the inlet 2. In fitting the inlet extension tube 7 the protrusions 15 are aligned with the notches 11, and upon full insertion of the tube 7 the protrusions 15 enter into a tight frictional fit with the notches 11 ensuring substantial if not complete sealing. Given their particular configuration the protrusions 15 could be readily provided on the inner surface of the inlet 2 in which case complementary notches would instead be provided on the flange 12 of the inlet extension tube 7.

[0022] It will be readily appreciated that the construction as described is simple to manufacture and each of the plastic components is itself capable of simple injection moulding. Consequently a water chamber according to the present invention is, while providing significant advantages, not significantly more expensive than existing chambers.

[0023] In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

[0024] The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function,

or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A water chamber (1) adapted for use in conjunction with a heater base and having a horizontally oriented gases inlet (2) in a wall thereof characterised by an elongate flow tube (7) extending into said water chamber (1) from the inner periphery of said gases inlet (2), an inlet end of said elongate flow tube (7) covering said inlet (2) and an outlet end of said flow tube (7) being spaced from the wall of said chamber (1), said flow tube (7) in use receiving, at said inlet end, gases supplied to said gases inlet (2), said gases passing through said flow tube (7) and exiting said flow tube at said outlet end distant from said wall.

2. A water chamber as claimed in claim 1 wherein said flow tube (7) extends for a distance of at least a quarter of the diameter of said water chamber (1).

3. A water chamber as claimed in claim 2 wherein said gases inlet (2) and said flow tube (7) are aligned radially and said flow tube (7) extends to approximately the middle of said chamber (1).

4. A water chamber as claimed in any one of claims 1 to 3 wherein said chamber (1) includes a vertically oriented gases outlet (3) in the roof of said chamber (1), said gases outlet (3) located beyond the termination of said flow tube (7), and a baffle wall (8) extending downwardly from the roof of said chamber (1) between the outlet end of said flow tube (7) and said gases outlet (3).

5. A water chamber as claimed in claim 4 wherein said baffle wall (8) is curved to be closest to said flow tube (7) at the centre thereof, the ends of said baffle wall (8) curved away from said flow tube (7).

6. A water chamber as claimed in any one of claims 1 to 5 wherein said water chamber comprises a transparent plastic shell (4) open at the bottom and having a peripheral flange (5), a heat conductive plate (6) enclosing said bottom of said shell (4) and sealed at its periphery to said flange (5), and said elongate flow tube (7) comprises a tubular extension member (16) fitted at said gases inlet (2).

7. A water chamber as claimed in claim 6 wherein said extension tube (16) includes a perpendicularly extending sealing flange (12) at one end thereof, and said gases inlet (2) of said water chamber includes a perpendicularly and inwardly extending annular sealing flange (10), and said sealing flange (12) of said extension tube (16) and said sealing flange (10) of said water chamber inlet (2) abut one another.

8. A water chamber as claimed in claim 7 wherein either said extension tube (16) or said gases inlet (2) includes a plurality of retaining protrusions (13) spaced around the circumference thereof, adjacent but spaced from the respective said sealing flange (10 or 12) such that in an assembled condition said protrusions (13) and the said adjacent sealing flange (10 or 12) engage the other said sealing flange (12 or 10) therebetween.

9. A water chamber as claimed in claim 8 wherein said adjacent sealing flange includes a notch (14) in the vicinity of each said retaining protrusion (13).

10. A water chamber as claimed in any one of claims 7 to 9 wherein either said extension tube (16) or said gases inlet (2) to said water chamber (1) includes one or more locating protrusions (15) around the circumference thereof adjacent to and contiguous with their respective sealing flange (10 or 12), and the other said sealing flange (12 or 10) includes one or more corresponding notches (11) into which said retaining protrusions (15) engage to restrain said extension tube (16)against rotational movement.

11. A water chamber substantially herein described with reference to and as shown in the accompanying drawings.

12. Any novel feature of combination features disclosed herein.

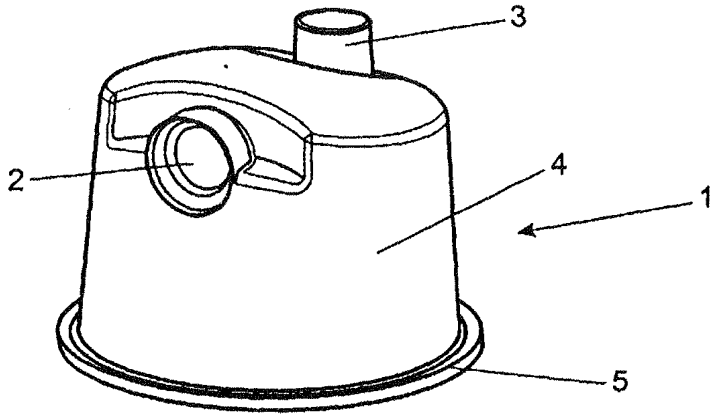

FIGURE 1

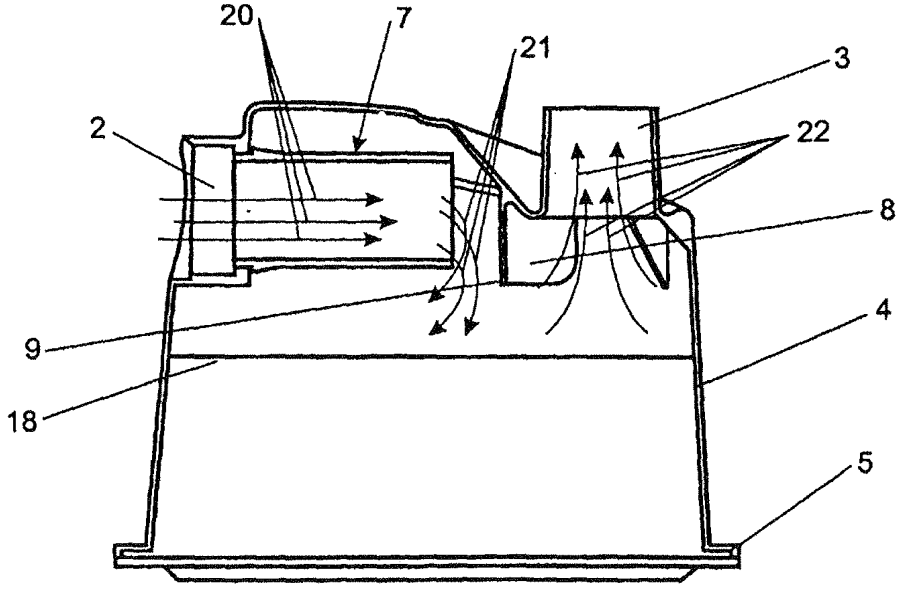

FIGURE 2

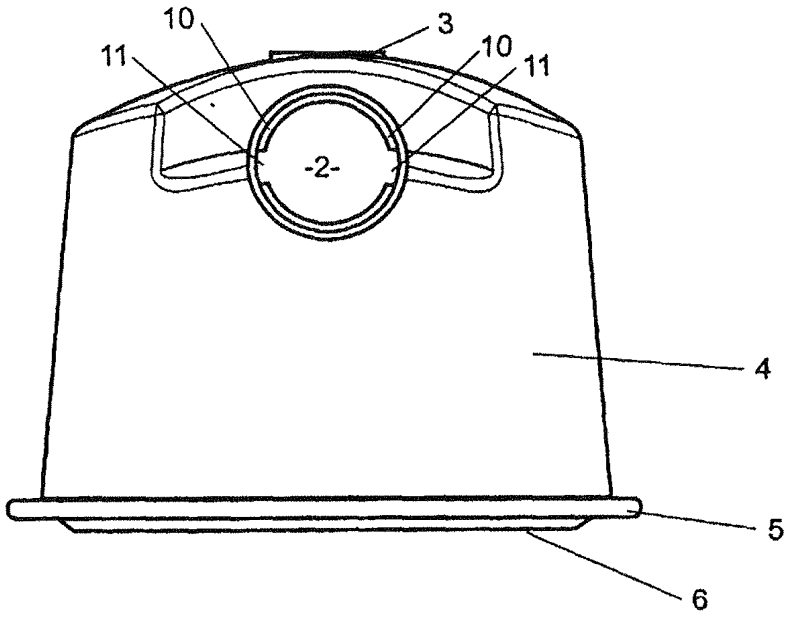

FIGURE 3

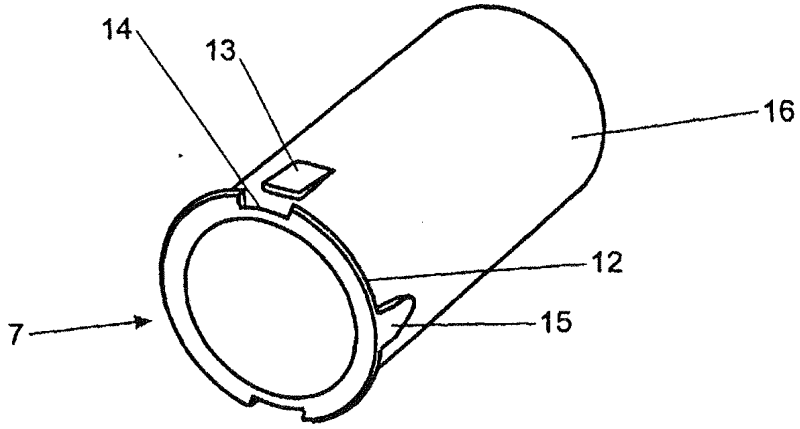

FIGURE 4

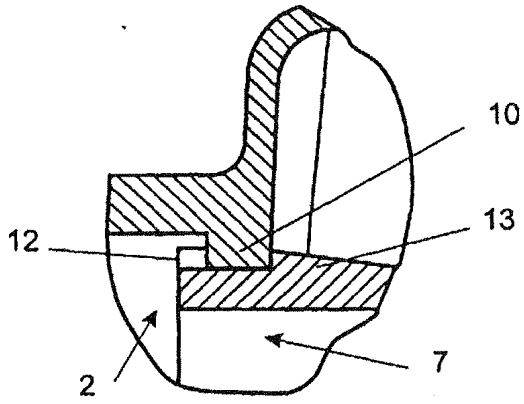

FIGURE 5

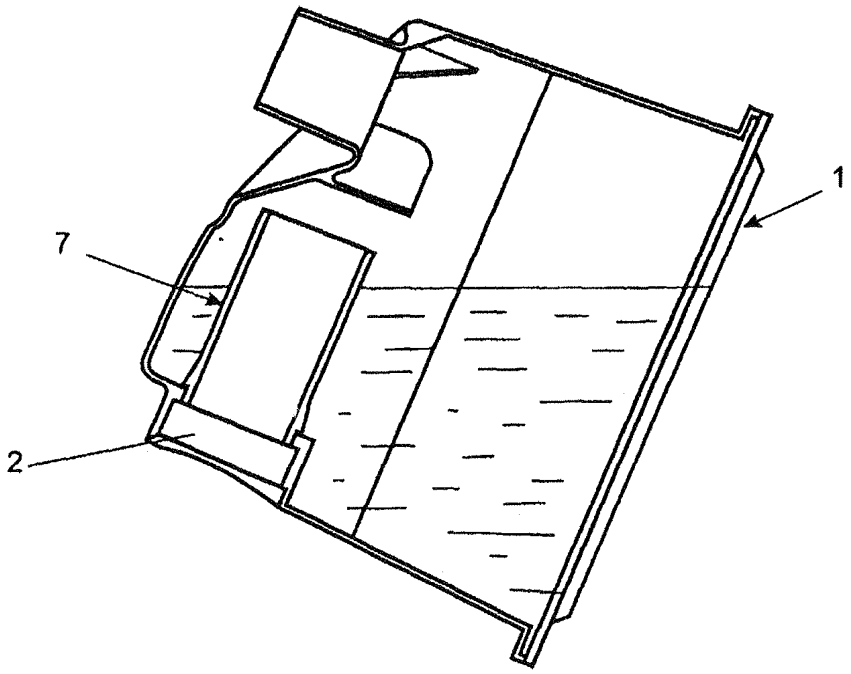

FIGURE 6

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A61M 16/00 | A1

(11) International Publication Number: WO 98/57691

(43) International Publication Date: 23 December 1998 (23.12.98)

(21) International Application Number: PCT/AU98/00474

(22) International Filing Date: 18 June 1998 (18.06.98)

(30) Priority Data:
PO 7422 18 June 1997 (18.06.97) AU

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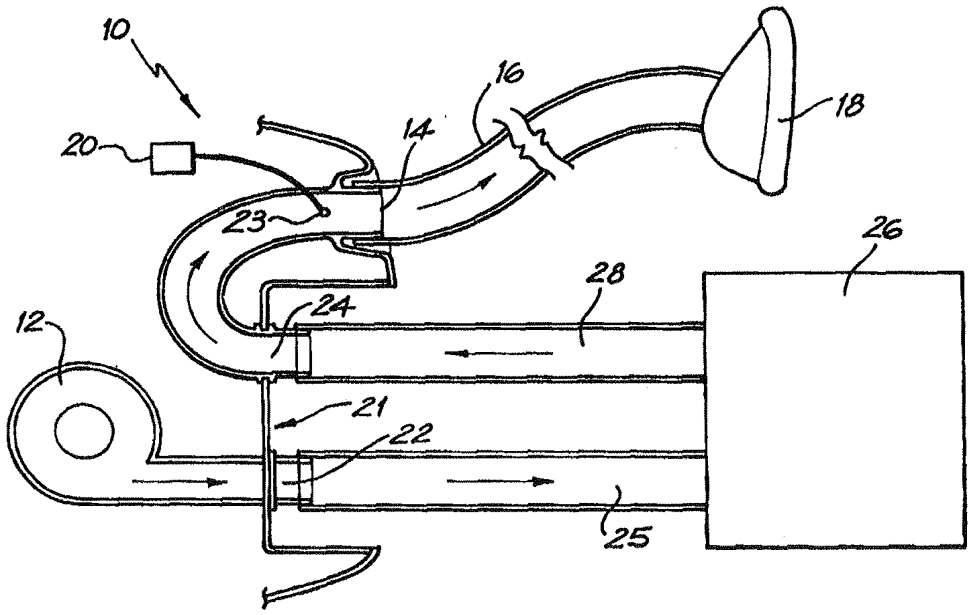
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: AN APPARATUS FOR SUPPLYING BREATHABLE GAS



(57) Abstract

An apparatus (10) for supplying breathable gas. The apparatus (10) includes a flow generator (12), a gas outlet (14), a connection means (21) interposed between the flow generator (12) and the pressure sensing means (20), the connection means having a connecting inlet (22) and a connecting outlet (24), a pressure sensing means (20) interposed between the connecting outlet (24) and the gas outlet (14). The connecting means (21) is adapted to allow selective connection to either a duct member (30) providing a direct flow path from the connecting inlet (22) to the connecting outlet (24) or to a humidifier (26) interposed between the connecting inlet (22) and the connecting outlet (24).

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AN APPARATUS FOR SUPPLYING BREATHABLE GAS

FIELD OF THE INVENTION

The present invention relates to an apparatus for supplying breathable gas.

The present invention has been developed primarily for use in Continuous Positive Airway Pressure (CPAP) treatment of, for example, Obstructive Sleep Apnea (OSA) in which pressurised air is supplied to a patient's airways to pneumatically splint them open. The pressure of the gas supplied to the patient can be constant, bi-level (in synchronism with patient breathing) or auto-setting in level. Throughout this specification any reference to CPAP is intended to incorporate a reference to any one of, or combinations of, these forms of pressurised gas supply.

The invention is also suitable for supplying gas for assisted respiration or mechanical ventilation.

BACKGROUND OF THE INVENTION

Some people find breathing the cool, dry air produced by the flow generator of a gas supplying apparatus uncomfortable, leading to possible lack of treatment compliance. It can also cause a dry or runny nose. This problem can be ameliorated by placing a humidifier in the gas flow path between the flow generator and the patient to moisturise the gas supplied to the patient. A humidifier basically is a reservoir of water over the surface of which the pressurised breathable gas flows. The water can be heated (known as an "active" humidifier) or unheated (known as "passive").

In some gas supply apparatus, in particular those used in CPAP treatment, it is desirable or necessary to monitor the pressure of the gas being supplied at the mask worn on the patient's face. This is generally done by monitoring the pressure at the flow generator with an electronic pressure transducer and then compensating for the known flow characteristics of the delivery tube and mask by calibration to determine the mask treatment pressure.

However, if a humidifier is placed between the flow generator and the mask (downstream of the pressure transducer) its pneumatic impedance of the gas flow may result in large pressure swings and the introduction of errors into the mask pressure calculation. Moreover, if the pressure signal is used to measure snore as an indication of partial apnea, the humidifier may muffle the snore component thereby reducing the accuracy of the snore measurement.

It is known to ameliorate these problems by using a hollow cylindrical plug having a pressure sensing port connected by a flexible tube to a pressure transducer mounted within the housing that contains the flow generator. If the apparatus is used without a humidifier the plug has one end connected directly to the flow generator

outlet and the other connected to the mask supply tube inlet. When a humidifier is used, the humidifier inlet is connected to the flow generator outlet and the humidifier outlet is connected to one end of the plug. The other end of the plug remains connected to the mask supply tube inlet. In this way, the pressure monitored by the pressure transducer is downstream of the humidifier and not affected by its alteration of the gas supply path.

However, this apparatus suffers from several problems. Firstly, the usage of the plug and associated tube is messy and unsightly. Further, the tube is thin and prone to kinking and/or squashing leading to inaccuracies in pressure measurement. Also, if the tube is removed and inadvertently replaced with a tube of different length or diameter, the accuracy of the mask pressure calculation is adversely affected. Finally, the apparatus suffers from the possibility that the humidifier or plug may be incorrectly installed, particularly when used by patients in the home and/or with humidifiers manufactured by a third party.

The above disadvantages may be ameliorated by incorporating a humidifier into the housing that contains the flow generator. However, this is uneconomical as many patients do not require this feature.

Accordingly, there exists a need for an apparatus for supplying breathable gas which can be easily and simply connected to a humidifier and which may also be quickly and simply configured to function without a humidifier, in which gas supply pressure is sensed downstream of the humidifier, if present.

The present invention is directed towards achieving one or more of these needs and, in particular, to substantially overcoming or at least ameliorating one or more of the disadvantages of the existing apparatus described above.

SUMMARY OF THE INVENTION

Accordingly, in the first aspect, the present invention discloses an apparatus for supplying breathable gas, the apparatus includes:

a flow generator;

a gas outlet;

a connection means interposed between the flow generator and the gas outlet, the connection means having a connection inlet and a connection outlet; and

a pressure sensing means interposed between the connection outlet and the gas outlet, wherein the connection means is adapted to allow selective connection to either a duct member providing a direct flow path from the connection inlet to the connection outlet or to a humidifier interposed between the connection inlet and the connection outlet.

The connection inlet receives gas from the flow generator. The connection outlet receives gas from the humidifier or the duct member, as the case may be.

Preferably, the breathable gas is air.

Desirably, the apparatus is connected by a gas supply tube to a patient "mask" to provide CPAP treatment, assisted respiration or mechanical ventilation. Mask varieties include nose masks, mouth masks, combination nose and mouth masks, nasal prongs, nasal pillows and full face masks.

The pressure sensing means is preferably an electronic pressure transducer.

The connection inlet and the connection outlet may be identical or may be different, for example in cross-sectional shape or diameter, in order to avoid incorrect installation of the duct member or the humidifier.

Preferably, the connection inlet and the connection outlet are recessed behind the outer edge of the casing or housing of the apparatus. In an embodiment, the duct member is in the form of a substantially U-shaped pipe adapted to connect the connection inlet and the connection outlet. The pipe preferably has an outer panel attached thereto which, upon installation, is substantially flush with adjacent outer panels of the casing or housing. In a preferred form the U-shaped pipe is comprised of two joined sections encased in a shape having a snap-engageable base and lid.

The humidifier can include a heater (ie. active) or be unheated (ie. passive).

In an embodiment, the apparatus also includes a gas flow rate sensing means interposed between the connection outlet and the gas outlet. In one form, the gas flow rate sensing means is a pressure differential flow sensor communicating with two pressure ports, the ports being respectively disposed on opposite sides of a flow impedance. In a preferred form, one of the pressure ports, preferably the port closest to the gas outlet, also communicates with the pressure sensing means.

The duct-member, and other components in the gas path, are desirably produced from antimicrobial materials. The duct member, and other components in the gas path, are also desirably disposable.

In a second aspect, the present invention discloses a CPAP treatment device incorporating the apparatus of the first aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a partial sectional schematic plan view of a first embodiment of a breathable gas supply apparatus according to the invention connected to a humidifier;

Fig. 2 is a view similar to Fig. 1, but showing the apparatus connected to a duct member;

Fig. 3 is a partial sectional schematic plan view of a second embodiment of a breathable gas supply apparatus according to the invention connected to a humidifier;

Fig. 4 is a view similar to Fig. 3, but showing the apparatus connected to a duct member;

Fig. 5 is a partial perspective view of the chassis of a third embodiment of a gas supply apparatus according to the invention connected to a duct member;

Fig. 6 is a view similar to Fig. 5 with the lid of the duct member removed;

Fig. 7 is a view similar to Fig. 5 with the duct member removed;

Fig. 8 is an exploded perspective view of the duct member shown in Fig. 5;

Fig. 9 is a schematic front view of another embodiment of the connection inlet and outlet; and

Fig. 10 is a schematic front view of a further embodiment of the connection inlet and outlet.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the Figs. 1 and 2, there is partially shown a first embodiment of an apparatus 10 for supplying breathable gas according to the invention. The apparatus 10 includes a flow generator 12 and a breathable gas outlet 14. The breathable gas outlet 14 is connected by a flexible gas supply tube 16 to a face mask 18 worn by a patient (not shown). A connection means, indicated generally at 21, is disposed between the pressure transducer 20 and the flow generator 12 and includes a connection inlet 22 and a connection outlet 24. A pressure sensing means, in the form of a pressure transducer 20 connected to a port tapping 23, is disposed between the connection outlet 24 the gas outlet 14.

In Fig. 1, the connection inlet 22 is shown connected to the inlet tube 25 of a humidifier 26. The connection outlet 24 is connected to the outlet tube 28 of the humidifier 26. Thus, the pressure transducer 20 measures the gas supply pressure downstream of the humidifier 26 and is not affected any pneumatic impedance i. introduces.

In Fig. 2, the apparatus 10 is shown configured without the humidifier 26. In this configuration, a duct member in the form of a substantially U-shaped pipe 30 provides a direct gas flow path from the connection inlet 22 to the connection outlet 24.

The main advantages of the apparatus are two-fold. Firstly, if a humidifier is used, gas supply pressure is measured downstream thereof and thus includes any pressure swings or variations introduced by the humidifier. Secondly, the apparatus can be quickly and easily converted between including, or not including, a humidifier in the gas supply path.

In the embodiment shown, the inlet 22 and outlet 24 are recessed behind the external boundary of the casing or housing 32 of the apparatus 10. The duct member 30 includes a panel 34 which, upon installation, is substantially flush with the casing 32 thereby providing a neat appearance to the apparatus 10.

Figs. 3 and 4 show a second embodiment of an apparatus 40 for supplying breathable gas according to the invention. Like reference numerals to those used in describing the first embodiment will be used to denote like feature with respect to the second embodiment.

The apparatus 40 includes a gas flow rate sensing means in the form of a pressure differential flow sensor 41 communicating with pressure tappings 42 and 44 provided either side of a flow impeding orifice 46.

Flow impedance can also be accomplished by providing a straw bundle, flexible membrane, vortex former or the like between the tappings 42 and 44.

Pressure measurement can be performed by using a separate pressure sensing means (not shown), such as the pressure transducer 20 and the tapping 23 from the first embodiment, or by measuring the pressure at one of the ports 42 or 44. The port 44 is preferable because it is closer to the gas supply conduit 16.

Figs. 5 to 8 show a third embodiment of an apparatus 60 for supplying breathable gas according to the invention. Like reference numerals to those used in describing the first embodiment will again be used to denote like features with respect to the third embodiment.

Figs. 5 to 7 show a mounting chassis 62 of the apparatus 60 with the upper external lid or cover removed. A pressure transducer (not shown) communicates with the supplied gas at port 64 provided in outlet tube 66. The tube 66 terminates in spigot 68 which is adapted for connecting to the gas supply conduit (not shown).

The chassis 62 includes a recess at 70 for fitment of a flow meter (not shown). A suitable flow meter is shown as item 50 in Figs. 6 to 10 of the applicant's international PCT patent application No. PCT/AU98/00082, the relevant disclosure of which is hereby incorporated by cross-reference. The flow meter shown in PCT/AU98/00082 includes a gas outlet in the form of a cylindrical tube (shown as item 58) which is positionable to protrude through U-shaped cut-out 72 (see Fig. 7) to constitute the connection inlet in a similar manner to the connection outlet 24 shown protruding from back wall 74 of chassis recess 76.

In this embodiment, the duct member 30 is comprised of two ABS plastic 90° tubes 77 connected by a DYNAFLEX (Trade Mark) thermoplastic elastomer connector produced by the GLS Corporation of OHIO, USA. Ends 78 and 80 of the duct member 30 include silicone 'O'-rings 81 coated with paralene. The duct member 30 is mounted within a box 82 comprising a base 84 and a lid 86 which are adapted to snap engage with one another.

The base 84 includes a recess 88 for engaging a tongue 88 (see Fig. 7) provided in chassis recess 70 to correctly position the box 82. The lid 86 includes a protuberance 90 which snap engages a complimentary recess in the lid (not shown) of

the apparatus 60 to retain the box 82 adjacent the chassis 62. The curved upper surface 92 of the box is a smooth continuation of the adjacent upper surface of the apparatus lid.

The U-shaped member 30 and the box 82 can be produced from an antimicrobial material or be disposable to reduce the risk of infection between different users of the apparatus 60. Other components in the gas path, such as the outlet tube 66, can also be made from antimicrobial material or be disposable.

Figs. 5 and 6 show the apparatus 60 configured for use without a humidifier. Fig. 7 shows the apparatus 60 in a configuration suitable for connection to the inlet and outlet tubes of a humidifier (after installation of the aforementioned flow sensor).

Figs. 9 and 10 show two embodiments of the connection inlet 22 and the connection outlet 24. In Fig. 9, the inlet 22 and the outlet 24 are circular but of different diameter. In Fig. 10, the inlet 22 and the outlet 24 have different cross-sectional shapes. In both cases the ends of the duct member and the humidifier inlet and outlet are provided with corresponding engaging formations to avoid incorrect installation. This is especially advantageous when a non-symmetrical or uni-directional humidifier is used.

Although the invention has been described with reference to a specific examples, it will be appreciated by those skilled in the art, that the invention can be embodied in many other forms.

CLAIMS:

1. An apparatus for supplying breathable gas, the apparatus includes;

a flow generator;

a gas outlet;

a connection means interposed between the flow generator and the gas outlet, the connection means, the connection means having a connection inlet and a connection outlet; and

a pressure sensing means interposed between the connection outlet and the gas outlet, wherein the connection means is adapted to allow selective connection to either a duct member providing a direct flow path from the connection inlet to the connection outlet or to a humidifier interposed between the connection inlet and the connection outlet.

2. An apparatus as claimed in claim 1, wherein the breathable gas is air.

3. An apparatus as claimed in claim 1 or 2, wherein the apparatus is connected by a gas supply tube to a patient mask to provide CPAP treatment, assisted respiration or mechanical ventilation.

4. An apparatus as claimed in claim 3, wherein the mask is a nose mask, mouth mask, combination nose and mouth mask, nasal prongs, nasal pillows or full face mask.

5. An apparatus as claimed in any one of the preceding claims including a gas flow rate sensing means interposed between the connection outlet and the gas outlet.

6. An apparatus as claimed in claim 5, wherein the gas flow rate sensing means is a pressure differential flow sensor communicating with two pressure ports, the ports being respectively disposed on opposite sides of a flow impedance.

7. An apparatus as claimed in claim 5 or 6, wherein one of the ports communicates with the pressure sensing means.

8. An apparatus as claimed in claim 7, wherein the port closest to the gas outlet communicates with the pressure sensing means.

9. An apparatus as claimed in any one of the preceding claims, wherein the pressure sensing means is an electronic pressure transducer.

10. An apparatus as claimed in any one of the preceding claims, wherein the connection inlet and the connection outlet are identical.

11. An apparatus as claimed in any one of claims 1 to 9, wherein the connection inlet and the connection outlet are different.

12. An apparatus as claimed in claim 11, wherein the connection inlet and the connection outlet are of a different cross-sectional shape or diameter.

13. An apparatus as claimed in any one of the preceding claims, wherein the connection inlet and the connection outlet are recessed behind the outer edge of the casing or housing of the apparatus.

14. An apparatus as claimed in any one of the preceding claims, wherein the duct member is in the form of a substantially U-shaped pipe adapted to connect the connecting inlet and the connecting outlet.

15. An apparatus as claimed in any one of the preceding claims, wherein the U-shaped pipe has an outer panel attached thereto which, upon installation, is substantially flush with adjacent outer panels of the casing or housing.

16. An apparatus as claimed in any one of claims 1 to 14, wherein the U-shaped pipe is formed from two joined sections encased in a box having a snap engageable base and lid.

17. An apparatus as claimed in claim 16, wherein the box is snap engageable with a housing or chassis of the apparatus.

18. An apparatus as claimed in any one of the preceding claims, wherein the humidifier includes a heater.

19. An apparatus as claimed in any one of claims 1 to 17, wherein the humidifier is unheated.

20. A CPAP treatment device incorporating the apparatus of any one of claims 1 to 19.

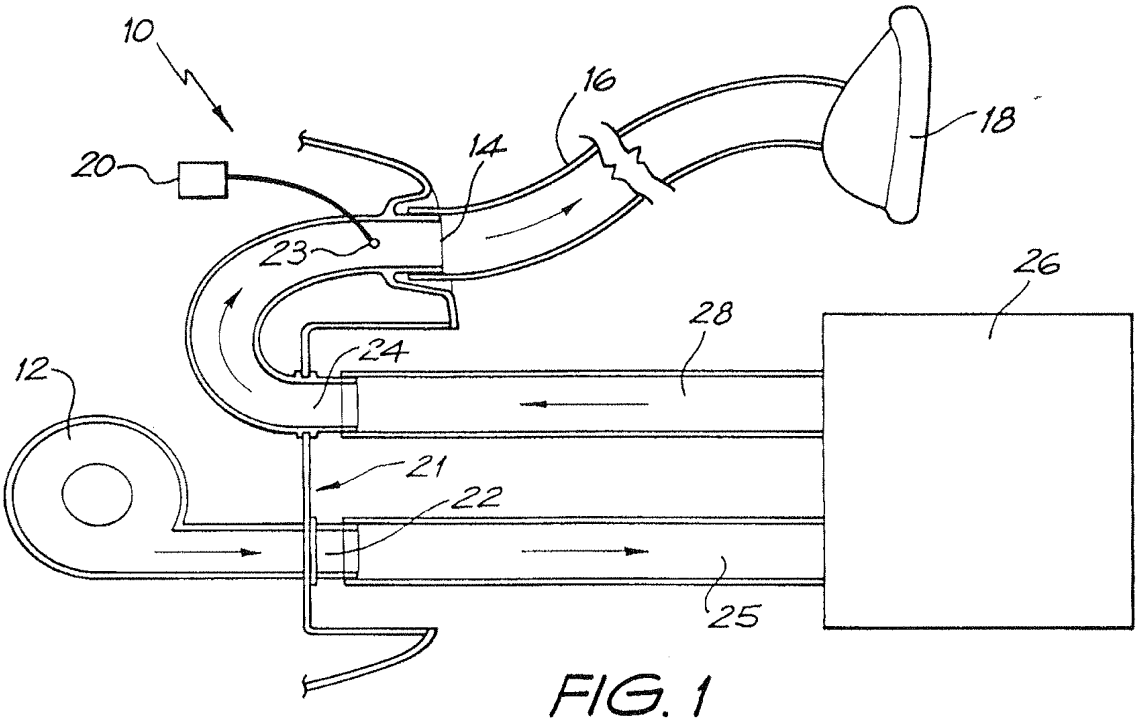
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FIG. 1

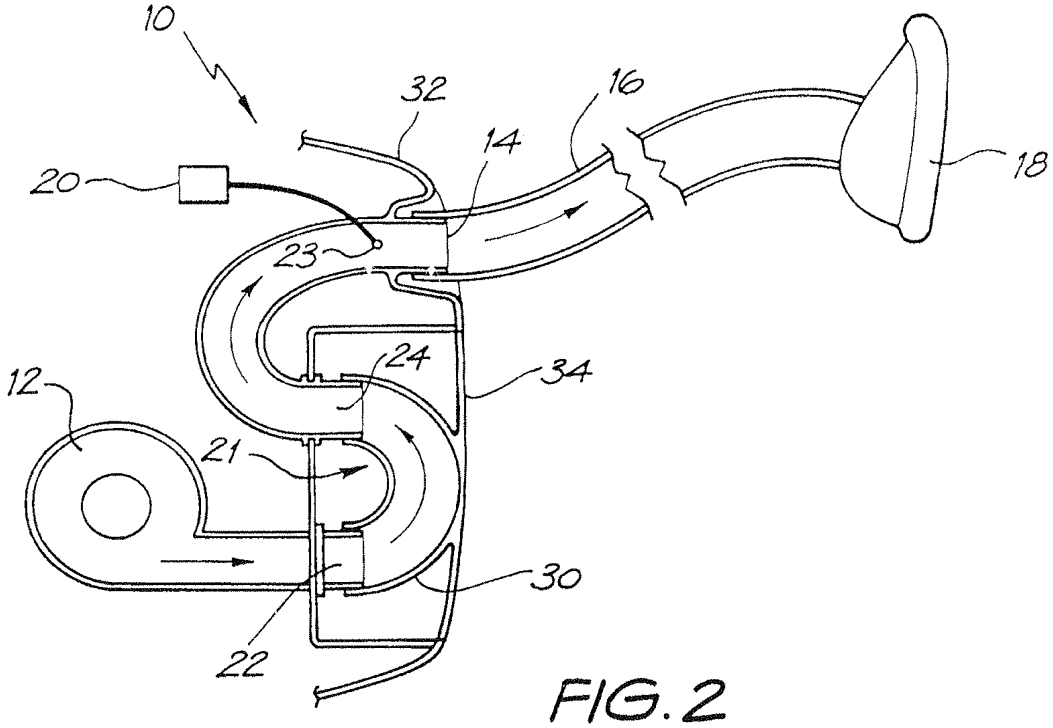
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FIG. 2

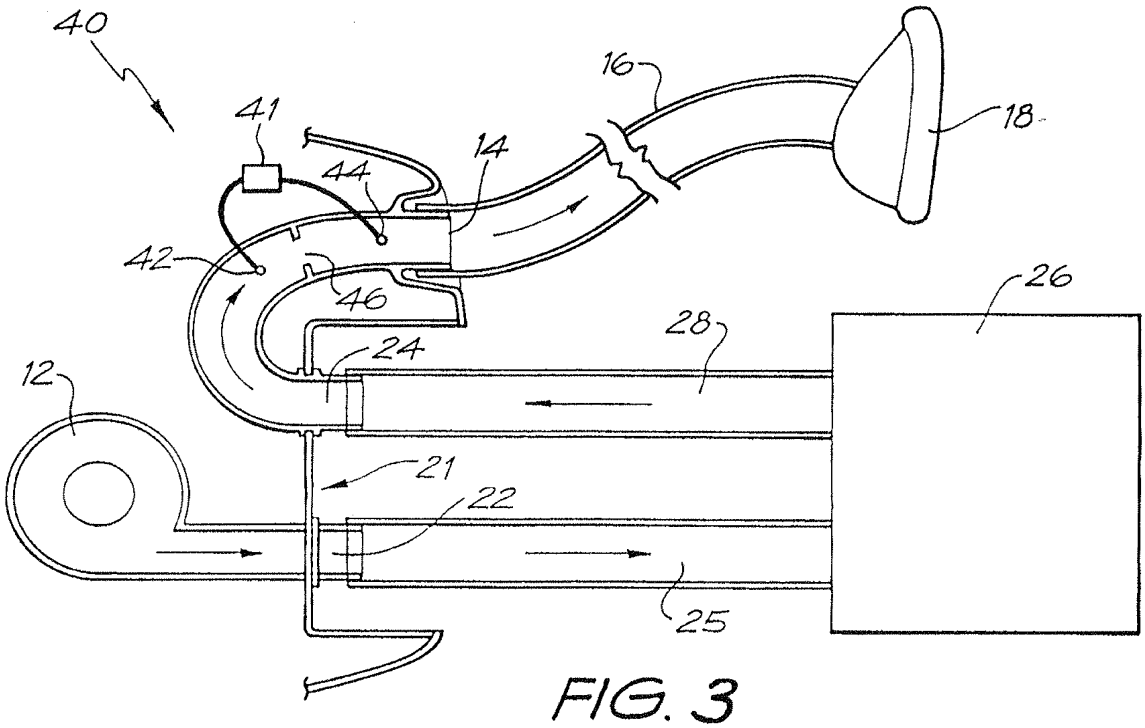
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FIG. 3

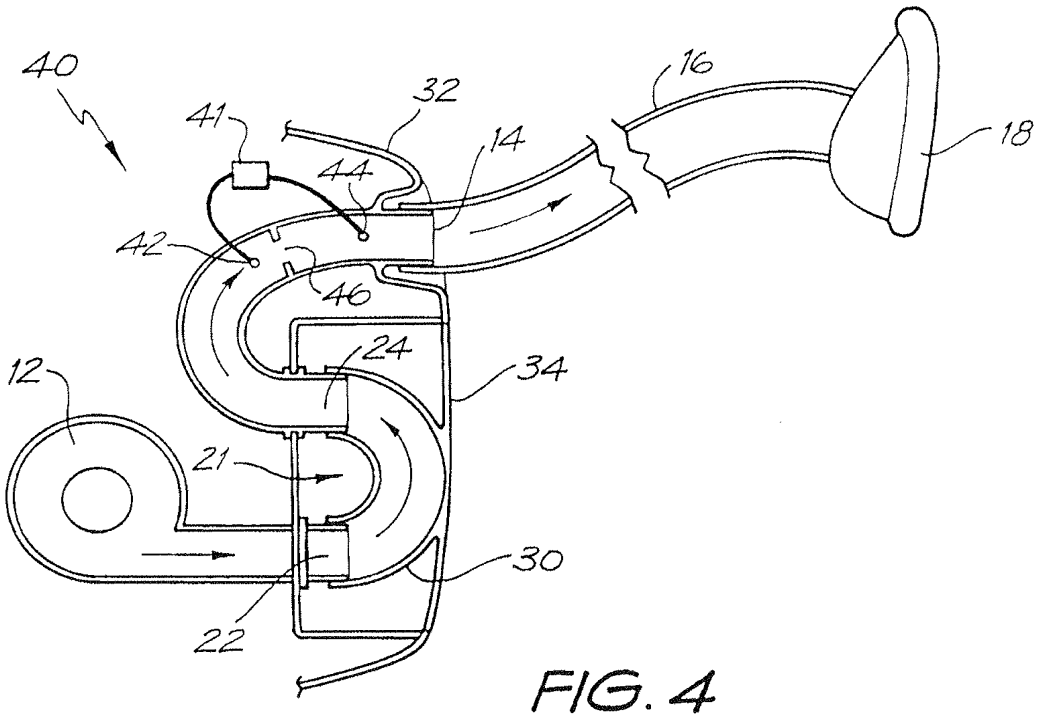
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FIG. 4

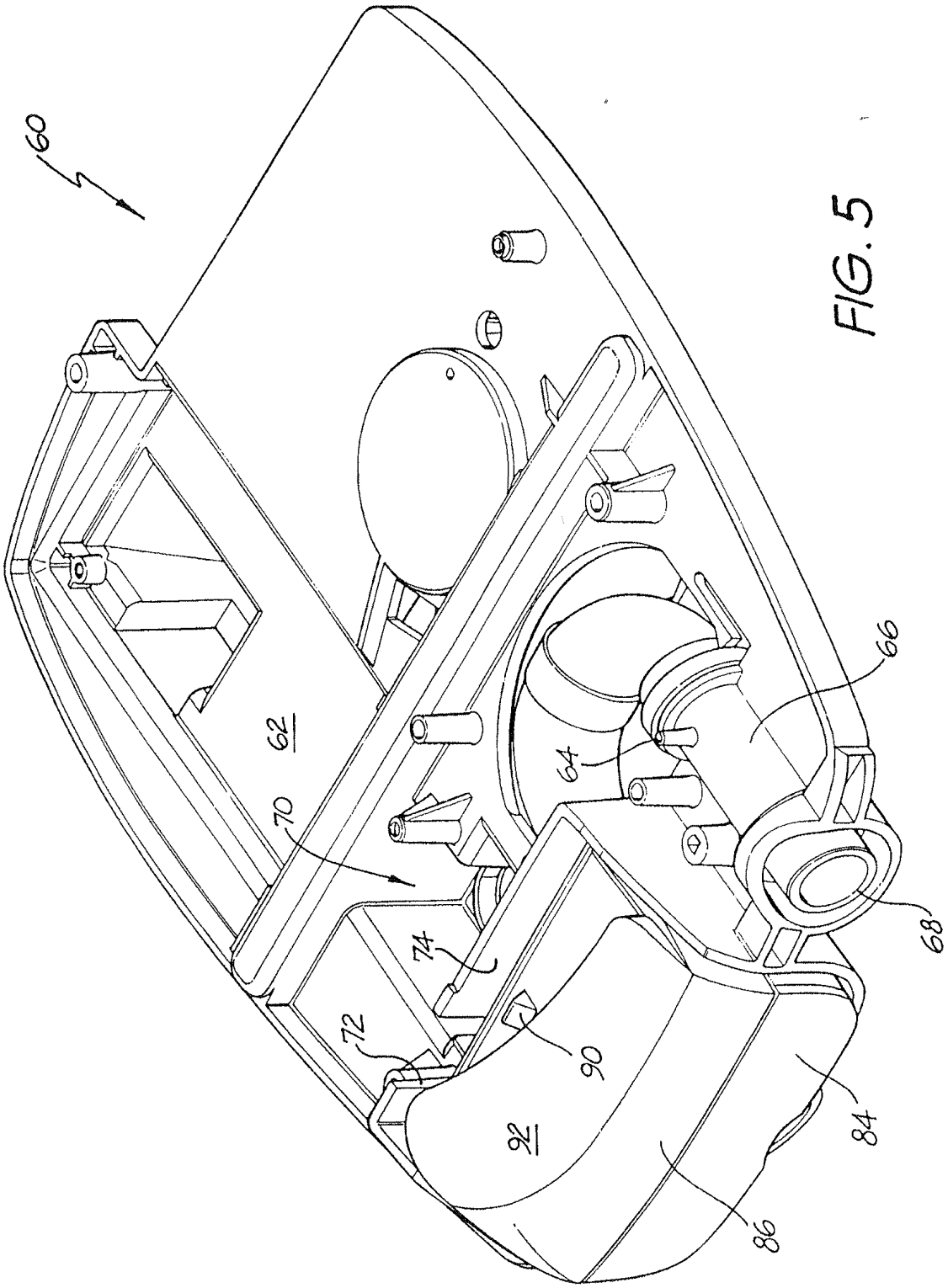

FIG. 5

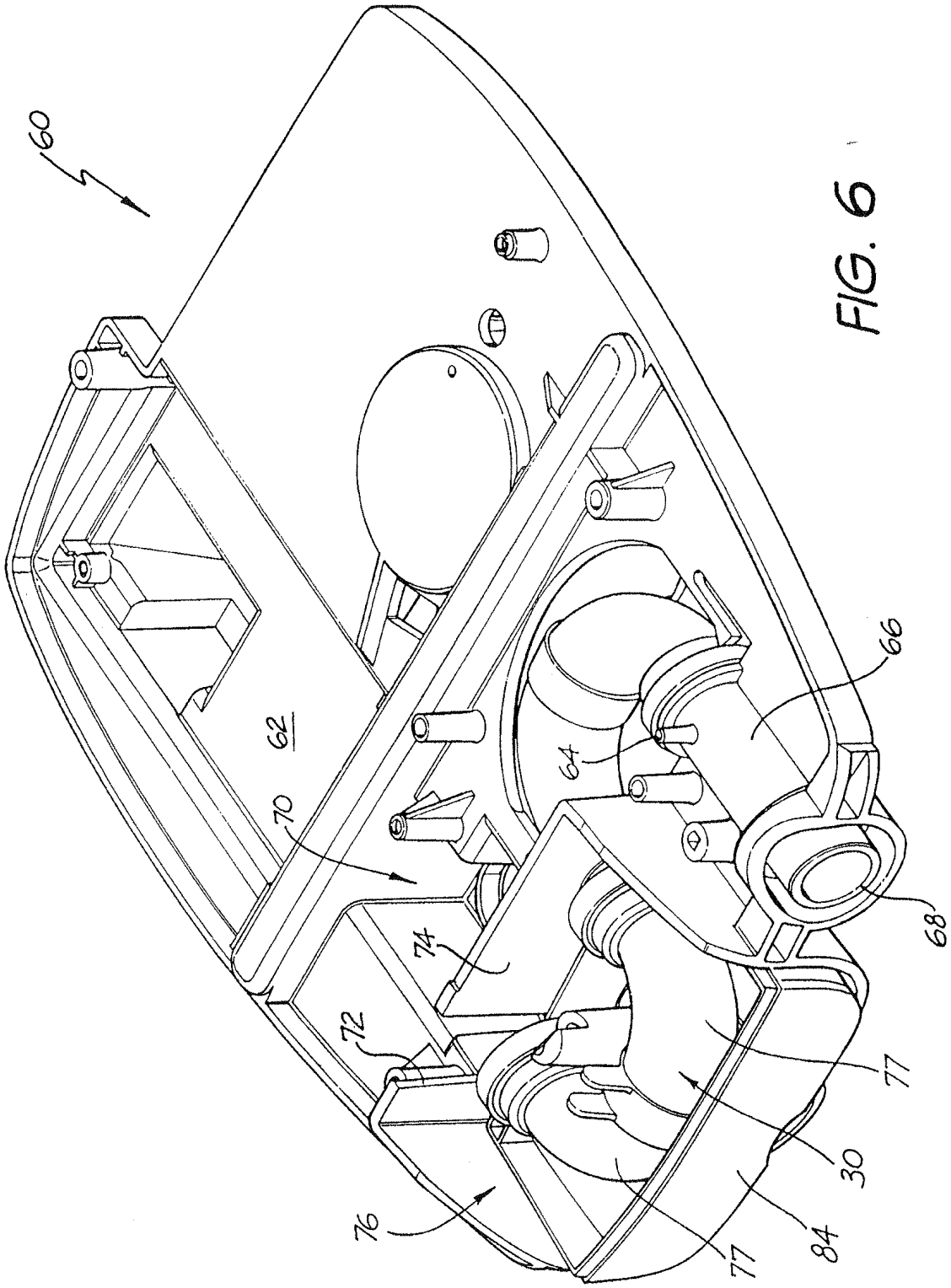

FIG. 6

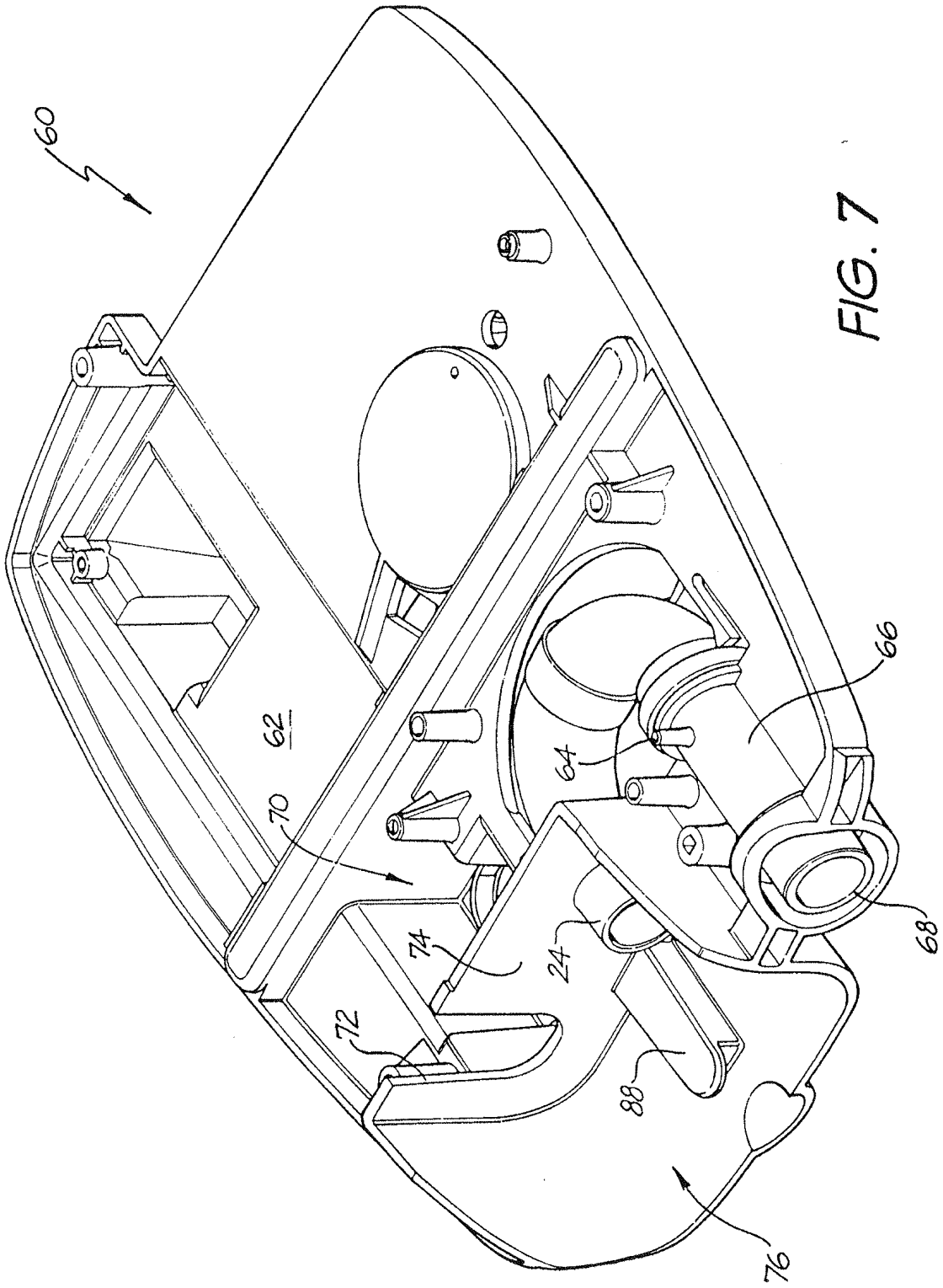

FIG. 7

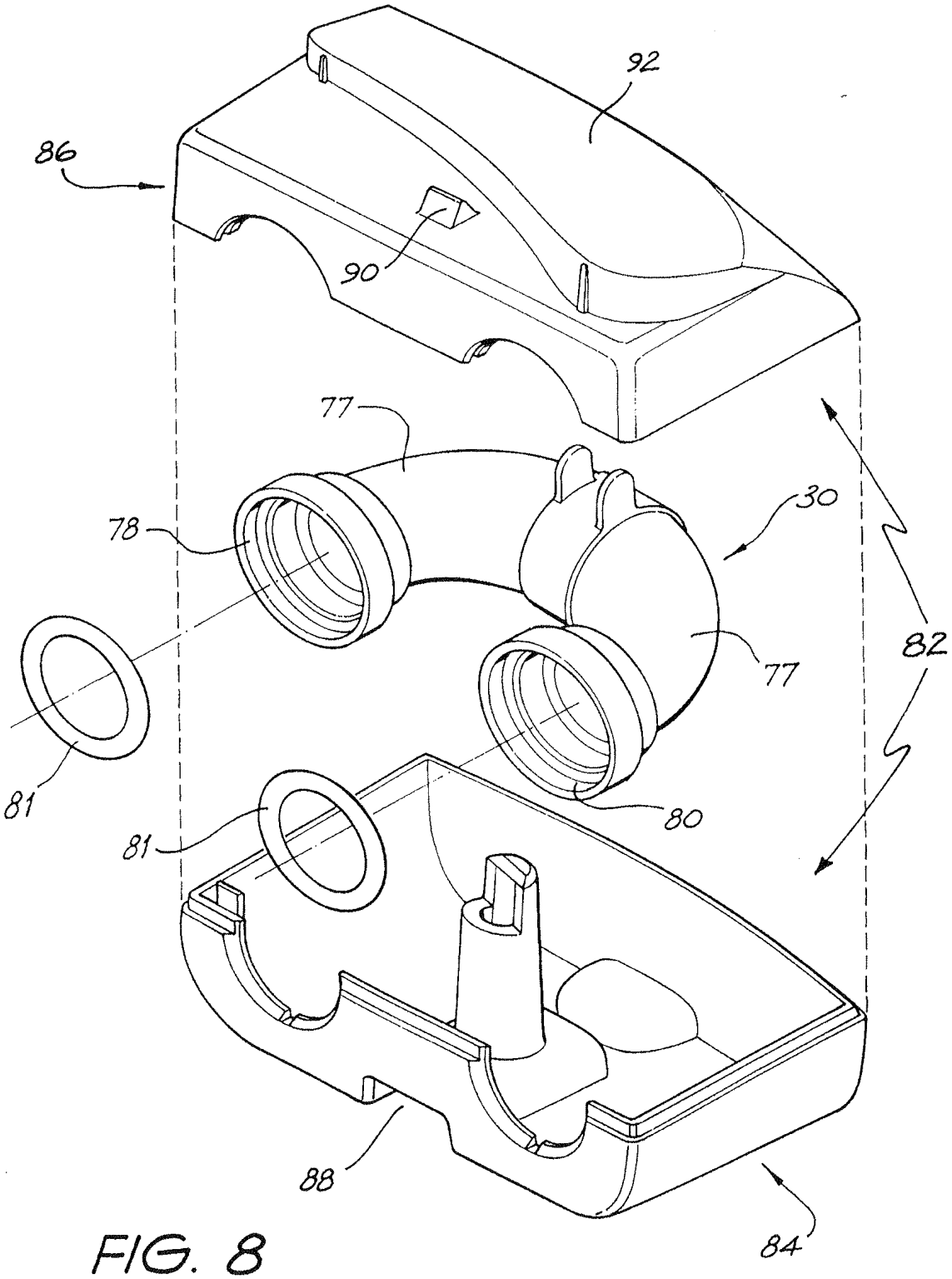

FIG. 8

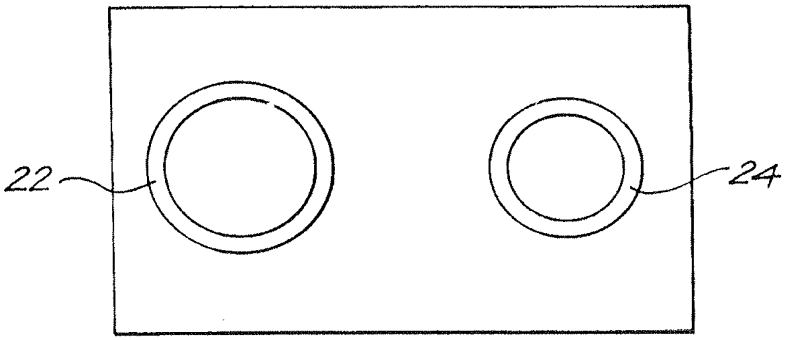

FIG. 9

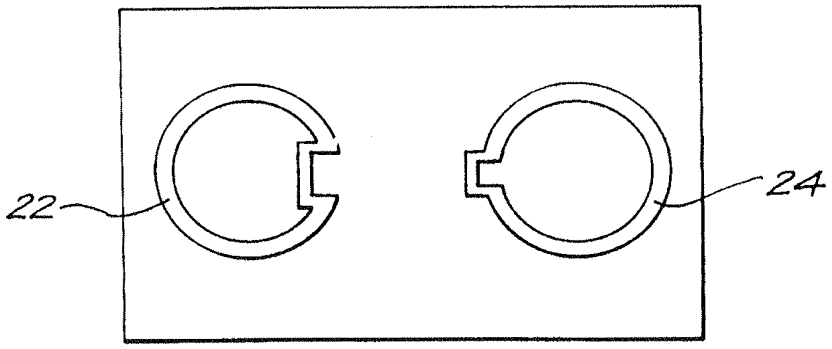

FIG. 10

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00474

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: A61M 16/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: A61M 16/IC

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT: HUMIDIFY, PRESSURE, SENSOR, TRANSDUCER, PROBE, RESPIRATION, BREATH VENTILATION,INSPIRATION, ANAESTHETIC, VAPOUR, CPAP, APNOEA, HYPOPNEA, SNORE, CONTINUOUS, POSITIVE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5537997 A (MECHLENBURG et al.) 23 July 1996 Figure 5, column 13 lines 20-27	1-20
P, X	AU 42027/97 A (NETZER) 5 February 1998 Entire document	1-20
X	WO 82/03326 A1 (VAS-ÉS MUSZERIPARI SZÖVETKEZET) 14 October 1982 Figure 1, page 7 line 2 - page 8 line 34	1-5, 9-20

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 July 1998	13 AUG 1998
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	Authorized officer **STEVEN WEISS** Telephone No.: (02) 6283 2466

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00474

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 298367 A2 (ADAHAN) 11 January 1989 Figure 4, column 2 line 20 - column 8 line 25	1-5, 9-20
X	EP 481459 A1 (DAR) 22 April 1992 Figure 1, column 2 line 58 - column 3 line 51	1-5, 9-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.
PCT/AU 98/00474

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	5537997	US	5540219	US	5655522	AU	60474/96
		CA	2196918	EP	777507	WO	9640335
AU	42027/97	WO	9804311	DE	19630466		
WO	8203326	EP	74943	SU	1212315	US	4539984
EP	298367	JP	1034374	US	4823787	US	4807616
		US	4941469	CA	1298167		
EP	481459	IT	1243853				

END OF ANNEX